

# Fiber-Optic Shape Sensing for Intelligent Solar Sail Deployment, Phase I

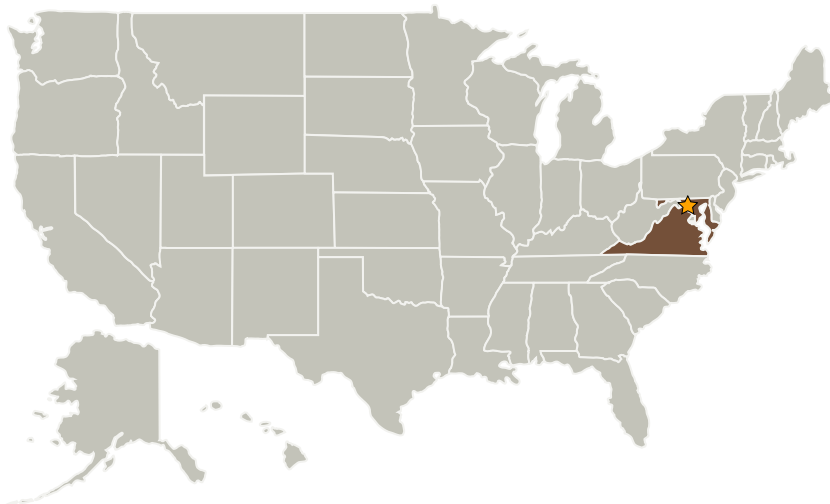
Completed Technology Project (2004 - 2004)



## Project Introduction

Luna Innovations proposes to develop a distributed fiber-optic shape sensor to provide a control system for the deployment of ultra-lightweight inflatable support structures for solar sails. This shape sensing system will provide the full-field 3D shape of the lightweight inflatable booms of solar sails at all points to sub-millimeter accuracy, permitting the monitoring of the dynamics of the structure before, during, and after deployment. These shape sensors, when fully integrated with the booms of solar sails and other inflatable space structures, will permit real-time active control of the deployment by providing a closed-loop feedback mechanism. Because the sensors and the system to monitor them will cost and weigh substantially less than the stereoscopic cameras currently used to monitor the 3D shape, this approach is highly desirable. By providing a reliable, lightweight means to monitor the dynamic solar sail deployment process, the risks associated with employing sail technology as a means of spacecraft propulsion will be substantially mitigated. This development will broadly enhance NASA's 'Missions in the Exploration of the Solar System' theme.

## Primary U.S. Work Locations and Key Partners



Fiber-Optic Shape Sensing for  
Intelligent Solar Sail  
Deployment, Phase I

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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission  
Directorate (STMD)

### Lead Center / Facility:

Goddard Space Flight Center  
(GSFC)

### Responsible Program:

Small Business Innovation  
Research/Small Business Tech  
Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Luna Innovations, Inc.	Supporting Organization	Industry	Roanoke, Virginia

## Primary U.S. Work Locations

Maryland	Virginia
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## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Roger Duncan

## Technology Areas

**Primary:**

- TX01 Propulsion Systems
  - └ TX01.4 Advanced Propulsion
    - └ TX01.4.1 Solar Sails